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1951 - 1955 PLANS OF THE DEPARTMENT OF TECHNICAL SCIENCES
CONCERNING HYDROELECTRIC POWER, CANALS, AND IRRIGATION

The Bureau of the Department of Technical Sciences, Academy of Sciences USSR, has approved a plan of works for the institutes, sections, and laboratories of the department for the years 1951 - 1955, in connection with the construction of new hydroelectric power stations, canals and irrigation systems.

Topics of the Power Engineering Institute imeni G. M. Krzhizhanovskiy, Academy of Sciences USSR, assume first place in the plan. By the end of 1955, the Power Engineering Institute is scheduled to undertake the following projects: work out the power balance and rational interconnection of the power systems of the Central, Volga, and Central-Chernozem regions; establish the expediency of integrating the Volga hydroelectric stations with the Ural, Southern, and Caucasus systems; and determine the most suitable distribution of electric power and capacity of the Volga hydroelectric stations as the systems develop.

The institute will develop the power scheme necessary for a single high-voltage network, establish firm bases for a rational structure of the integrated electric power system for the European USSR, and determine power reserves and their arrangement in the integrated electric power systems. As a result of these investigations, recommendations and data to assist in directing the planning of electrical systems and system interconnections will be prepared.

The institute will work out the power scheme necessary for electrification of agriculture in the lands along the Volga, using the electricity of the Kuybyshev and Stalingrad hydroelectric stations, and power schemes for electrically driven tractor cooperatives, under conditions governing the complete electrification of agricultural production. This work will be carried out with the All-Union Institute for Electrification of Agriculture and the Agricultural Academy imeni K. A. Timiryazev. As a result of these investigations, recommendations and compilations of the technical conditions necessary for planning and operating electric power systems will be made.

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Schemes for supplying electricity will be investigated, and the technology and engineering necessary for planning the electrification of the main railroad lines will be worked out. The investigation will be carried out jointly by institutions belonging to the republic Academies of Sciences and to the affiliates of the Academy of Sciences USSR and by the Sections for the Scientific Solution of Transport and Water Economy Problems, Academy of Sciences USSR.

The Institute of Mineral Fuels, Academy of Sciences USSR, has directed special attention to the rational utilization of the combustible shale resources concentrated in the regions of the Kuybyshev and Stalingrad hydroelectric stations.

The construction of high-power hydroelectric stations will permit railroads to change from steam to electricity, which will stimulate the development of high-speed transport and, consequently, require the manufacture of higher-quality rails. In this connection, the Metallurgical Institute imeni A. A. Baykov will develop a method for improving the quality of rails.

The Institute of Mechanics will develop further the theory of ground masses, and also apply the results to the two-dimensional problem of the theory of elasticity in the design of hydrotechnical structures. The following investigations will be carried on: methods for designing support walls and massive dams, calculating external loads, temperature, and settling; methods for calculating slopes and foundations of hydrotechnical structures; methods for computing the contraction of the body and care of alluvial dams.

The institute will work out new problems, connected with the theory of filtration, of computing the nonstationary filtration that takes place during the construction of hydrotechnical structures, and also the steady-state filtration under hydrotechnical structures in the case of a porous medium with variable permeability. The results of these investigations will enable one to determine the optimum size of hydrotechnical structures and to establish zones that are heated slightly by ground waters.

The Section for the Scientific Solution of Transport Problems, Academy of Sciences USSR, is promoting the study of two topics: engineering-economic basis for the development and utilization of transport, and basic methods for the electrification of railroads.

The problem is to determine the most effective utilization of the various means of transportation, and traffic and railroad capacities at junction and intersection points; scientific selection of the parameters that best characterize means of transport; and methods for studying the unified technology of transport junctions when mixed transportation is involved.

The Section for the Scientific Solution of Water Economy Problems, Academy of Sciences USSR, had already introduced natural observations on the dynamics and regime of ground waters under irrigated lands under various natural conditions; up to the present, however, the laws governing the formation of river beds under conditions of flow regulation and the principles governing the location of river-bank constructions on regulated rivers had not been studied. The section will study the variation of the ground-water regime under the action of irrigation and drainage canals, in connection with the construction of the Stalingrad and Main Turkmen canals, and under the action of reservoirs, in connection with the construction of the Kuybyshev, Stalingrad, Amu-Darya, and Kakhovka hydroelectric stations. As a result of these investigations, the section will establish a procedure for regulating the ground-water regime in regions around reservoirs, and will develop the laws governing deformations of river-bed channels under the influence of flow regulation and also the principles governing the location of channel constructions.

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The section will calculate floods, maximum flow, and norms of allowable velocity for various soils and strengthening of river channels and canals.

Methods of planning the hydrological regime of supported waterways of a cascade of reservoirs and investigations of expedient forms of joint operation of several reservoirs during water shortages, with the purpose of determining the operating conditions for hydroelectric stations, have to be worked out. Finally, methods must be worked out for planning and utilizing reservoirs to increase the output of hydroelectric power and decrease its cost.

The section has carried out theoretical investigations, experimental laboratory observations, and observations of hydrotechnical constructions which will permit the establishment of scientific basic norms to be used in calculating the permissible (critical) erosion velocity for various ground foundations and in strengthening river channels and canals.

The Institute of Automatics and Telemechanics is to work on the automatic regulation of large hydroelectric stations. The problem posed is the complicated one connected with the dynamics of automatic regulation of voltage and frequency, power factor, reactive power, and with the selection of rational types of regulators and controls.

A high degree of automatic operation ensures maximum output and reliable operation of installation, units, and systems and results in minimum losses and lowered specific cost of power.

The institute will develop a rational system for equipping excavators with electric drives which will permit developing the new type of excavator necessary in constructing canals and hydroelectric stations.

The great quantity of cheap electric power, which will result from the construction of the new hydroelectric power stations, will be employed extensively in agriculture. In this connection, the Institute of Automatics and Telemechanics intends to create the most efficient system of electric drive and power supply for electrically driven tractors.

The institute will also solve the theoretical and practical problems involved in the telemechanization of large power systems and long transmission lines, and in the operation of large irrigation systems.

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